

NASA/University JOint VEnture (JOVE)Program

FINAL TECHNICAL REPORT

Date: January 15, 2001

NAG8-1286

July 1996

August 2000

Grant Number

Report Period:

From

To

Girija Subramaniam sxg11@psu.edu

Name

E-Mail Address

Synthesis of Two-Photon Materials and Two-Photon Liquid Crystals

Research Title

Institution Name:

Penn State University

Address:

Highacres

Hazleton, PA 18201

NASA/University JOint VEnture (JOVE)Program

FINAL TECHNICAL REPORT

I. Summary of Research

The following represents a comprehensive summary of significant accomplishments over the duration of the grant. *(Attach additional page(s) and/or relevant documentation as necessary.)*

The duration of the grant was interrupted by two major accidents that the PI met With- an auto accident One in Pasadena, CA during her second summer at JPL which Took almost 8 months for recovery; a second accident during Fall 2000 that left her in Crutches for the entire semester. Further, the time released agreed by the University was not given in a timely fashion. The candidate has been given post –grant expire time off.

In spite of all these problems, the PI synthesized a number of new two-photon materials And studied the structure-activity correlation to arrive at the best-optimized structure. The PI's design proved to be one of the best in the sense that these materials has a Hitherto unreported Two-Photon Absorption Cross Section. Many materials based on PI's design was later made by the NASA colleague. This is Phase I.

Phase II of this grant is to orate liquid crystalline nature into this potentially useful materials and is currently in progress. Recent observations of nano- and pico-second response time of homeotropically aligned liquid crystals suggest their inherent potentials to act as laser hardening materials i.e. as protective devices against short laser pulses. The objective of the current project is to exploit this potential by the synthesis of liquid crystals with high optical nonlinearity and optimizing their performance. The PI is trying structural variations to bring in liquid crystalline nature

NASA/University JOint VEnture (JOVE)Program

FINAL TECHNICAL REPORT

without losing the high two-photon cross section. Both Phase I and Phase II led to many invited presentations and publications in reputed Journals like Science, Molecular Crystals. The list of presentations and reprints are enclosed

Another important and satisfying outcome of this grant is the opportunity that this grant offered to the budding undergraduate scientists to get involved in a visible research of international importance. All the students had a chance to learn a lot during research, had the opportunity to present their work at the National level conferences. They continue to retain their interest in their research and went on to accomplish further laurels.

NASA/University JOint VEnture (JOVE)Program

FINAL TECHNICAL REPORT

II. Subject Inventions

Provide a complete list of all subject inventions or patents resulting from work performed under the award or provide a statement that there were none.

PSU invention disclosure # 97-1852, submitted May 2000

Signature

January 15, 2000

Date

For Summaries of Research and published reports, one Micro-reproducible copy shall be sent to the NASA Center for AeroSpace Information (CASI), Attn: Acquisitions Department, 7121 Standard Drive, Hanover, Maryland 21076-1320.

NASA/University JOint VEnture (JOVE)Program

FINAL TECHNICAL REPORT

Presentations at International and National Conferences

Two Photon Absorbers: Synthesis and Structure-Activity Correlation Study–
G. Subramaniam, J. Perry, S. R. Marder -*NASA-JOVE Annual Retreat*, July 1-5,
1997, Pasadena, CA.

Design, synthesis, and applications of two-photon absorbing organic molecules.
S. Barlow, D. Beljonne, J. L. Brédas, B. H. Cumpston, J. Y. Fu, J. E. Ehrlich, A.
A. Heikal, T. Kogej, S. M. Kuebler, M. D. Levin, S. R. Marder, D. McCord-Maughon,
B. J. W. Perry, H. Röckel, M. Rumi, G. Subramaniam, S. Thayumanavan, X. L. Wu,
C. –*National American Chemical Society Meeting*, Chicago, August 23-27, 1998
D. (Invited Paper)

The above paper is also presented at the International Symposium on Optical
Science, Engineering and Instrumentation, *SPIE's 44th Annual Meeting*, Denver,
Colorado, July 18-23, 1999. Authors as in paper 8. (Invited Paper)

Synthesis of NLO-LC Materials - G. Subramaniam, Richard Gill, Jason
Andras, *International Liquid Crystal Conference*, July 19-24, 1998, Strasbourg,
France

Synthesis of Twp-photon-LC Materials - G. Subramaniam, , Jason Andras, Richard
Gill. Mark Slaska *International Liquid Crystal Conference*, July 24-28, 2000,
Sendai, Japan

Publications

Design of Organic Molecules with Large Two-Photon Cross Sections –
M. Alabota, D. Beljonne, J. L. Bredas, J. E. Ehrlich, J. Y. Fu, A. A. Heikal, S. E. Hess, T.
Kogej, M. D. Levin, S. R. Marder, D. McCord –Maughon, J. W. Perry, H. Rockel, M.
Rumi, Girija Subramaniam, W. W. Webb, X. L. Wu, C. Xu, *Science.*, 1998, 281, 1653-
56.

Synthesis of Twp-photon-LC Materials - G. Subramaniam, , Jason Andras, Richard
Gill. Mark Slaska – *Mol. Cryst. Liq. Cryst.*, *accepted* or publication.